National Science Foundation
Directorate for Computer and Information Science and Engineering Advisory Committee (CISE AC)

May 15-16, 2014

National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

MEETING SUMMARY

The spring meeting of the National Science Foundation's Directorate for Computer and Information Science and Engineering's Advisory Committee (CISE AC) was held at the National Science Foundation on May 15-16.

Thursday, May 15, 2014

Welcome, Review of Agenda, and Approval of Minutes

Dr. David Culler, CISE AC co-chair, opened the meeting at 12:30 p.m. and welcomed all in attendance, including two new members, Drs. Victoria Stodden and Craig Partridge. A list of all AC members in attendance may be found in Appendix I. After the AC members introduced themselves, the minutes from the AC's January 2014 virtual meeting were unanimously approved.

CISE Update and FY15 Budget Priorities

Dr. Farnam Jahanian, CISE Assistant Director (AD), welcomed the AC and provided an update on NSF and CISE leadership changes, highlighting the new NSF Director Dr. France Córdova, the appointment of Ms. Irene Qualters as Division Director for Advanced Cyberinfrastructure, the appointment of Mr. James Donlon as Deputy Division Director for Computing and Communication Foundations, and ongoing searches for new Division Directors for Information and Intelligent Systems and Computer and Network Systems.

Dr. Suzi Iacono, CISE Deputy Assistant Director, joined Dr. Jahanian in updating the AC on CISE activities and provided an overview of the President's Fiscal Year 2015 Budget Request for NSF and CISE.

Drs. Jahanian and Iacono took a few questions, leading to a discussion of strategies for effectively communicating the value of U.S. investment of CISE research, the digital divide in an aging population, and the need to recognize that the rapidly changing technology landscape could evolve in unexpected ways.

Slides from the CISE Update are posted on the CISE AC website.

Computer Science Education and Workforce Development

Discussion on CISE Broadening Participation in Computing Alliances
Dr. Jan Cuny, CISE Program Director, discussed NSF's efforts to expand computer science education and reverse underrepresentation in the field throughout the career pipeline. Dr. Cuny described NSF's Broadening Participation in Computing Alliances program and highlighted key needs for the computing community that have informed NSF's recent efforts, such as a connection between education and broadening participation programs, sustainment of a national community, high-quality evaluation and research of current efforts, and continuous and sustainable efforts.

CEOSE Update
Dr. Charles Isbell updated the AC on activities of NSF's Committee on Equal Opportunities in Science and Engineering (CEOSE). This year, CEOSE recommended that NSF develop a new, bold, center-scale initiative to broaden participation in science and engineering. Dr. Isbell acknowledged that the existing Broadening Participation in Computing Alliances are already accomplishing some of what might take place at the centers envisioned by CEOSE, but that these centers would also offer a significant focus on research and could provide an opportunity for making these efforts multidisciplinary. The AC noted that many broadening participation challenges are discipline-specific and therefore questioned the extent to which the focus should be multidisciplinary.

The AC discussed CISE's Education and Workforce Development activities, including the partnership between CISE and the Directorate for Education and Human Resources, current partnerships, CEOSE's support for the Alliances, alternates to center-scale models, and the value of investing in the science of learning.

The group adjourned for a break, followed by breakout sessions that discussed the *Future of Computer Science and Engineering Departments and Colleges*.

Cybersecurity Ideas Lab Report
Dr. Craig Partridge presented an overview of a Cybersecurity Ideas Lab, held February 10-12, 2014, and sponsored by NSF. This Ideas Lab convened a multidisciplinary group of experts from academia, industry and government to develop new ideas for significantly enhancing the security of the Internet ecosystem.

Dr. Partridge described underlying themes that emerged in the Ideas Lab: the Internet continues to evolve; securing systems should be the norm; there is need for government leadership; and there is need for better information about cybersecurity incidents and responses. The workshop resulted in 16 concrete recommendations centered around the themes of Technology, Policy and Leadership.

The group discussed the cross-sector nature of the recommendations, the role of government in implementing these recommendations, incentives for adoption of security updates in various contexts, and the value of cross-sector exchange of information, especially between academic researchers and industry practitioners.

Discussion with Tom Kalil
Mr. Tom Kalil, Deputy Director for Technology and Innovation at the White House Office of Science and Technology Policy (OSTP) and Senior Advisor for Science, Technology and Innovation at the National Economic Council, described OSTP's role of identifying ideas and activities in support of the President's priorities. He described current priority areas and initiatives, including the BRAIN Initiative, the Big Data National R&D Initiative, the National Robotics Initiative, cyberlearning, national security and high performance computing, STEM education, and life-long learning and workforce development.

The group discussed a range of topics, including the recent White House review of Big Data and Privacy, open access and the potential for innovation in dissemination of scientific results, small-scale manufacturing, workforce development, the growing need for computer science proficiency across all disciplines, and the future of CISE research.

The AC adjourned for the day at 6 p.m.

Friday, May 16, 2014

Report-out from Discussion on the Future of Computer Science and Engineering Departments and Colleges
The AC resumed at 8:45 a.m. with report-outs from the two discussion groups that met the previous afternoon. The two discussion groups agreed that growing enrollment of students in computer science and engineering courses requires a more proactive strategy for academic institutions to effectively manage this growth. The groups also agreed that better data are needed to document this trend, including motivation and demographics of students; that messages need to be developed to describe to university leadership how this growth is different from the dot-com era; and that sharing best practices would be beneficial.

Midscale Infrastructure Subcommittee Report
Dr. Jim Kurose presented the report from the Midscale Infrastructure Subcommittee for approval to the AC. The report addresses four issues: (1) *How the community infrastructure requirements should be derived* – for which the group solicited community input through an open call for white papers through the Computing Community Consortium (CCC). A common vision articulated in many responses was the need for "a nationwide, multi-tiered system … that is sliced, deeply programmable, virtualized, and federated so that research experiments can run 'end to end' across the full suite of infrastructure." (2) *How CISE can articulate a framework for understanding the value of novel infrastructure to transformational research.* The group recommended that a paper/report documenting research advances resulting from the use of experimental infrastructure could play a valuable role in informing the larger research community of the importance and impact of research infrastructure. (3) *Identifying the best models of funding community mid-scale infrastructure.* The group recommended that future funding and management models for mid-scale infrastructure address issues of testbed timescale, the development of physical and human capital, and funding models that incent campus co-investment and create and/or leverage public-private partnerships. (4) *Future research*

infrastructure: leveraging GENI (the Global Environment for Network Innovations) and beyond. The group discussed the criticality of leveraging existing GENI resources and experience.

The AC approved the report.

CISE Vision 2025 Working Group Update

Dr. James Landay provided an update on the CISE Vision 2025 working group, which was charged with envisioning future trends and opportunities in computing research over the next 10-15 years. To get broad community input, the group is working in collaboration with the CCC to hold workshops in three areas: Interacting with the Computers All Around Us; The New Making Renaissance: Programmable Matter and Things; and Computing and the Smart World. The first workshop occurred earlier in the week of the AC meeting and was led by Drs. Daniela Rus, Limor Fix, and Jennifer Rexford. The second is scheduled to take place on June 4-5, and the third had not yet been scheduled. Discussion with the AC centered on the potential outcomes of this activity; many agreed that white papers would be appropriate.

NSF Program Updates Part I

Overview of Advanced Computing Infrastructure Activities at NSF and of the National Strategic Computing Initiative Fast Track Action Committee (NSCI-FTAC)

Ms. Irene Qualters, Division Director of Advanced Cyberinfrastructure, joined the AC via teleconference to provide an update on recent reports to inform the future of cyberinfrastructure. The National Academy of Science Computer Science and Telecommunications Board is conducting a study on *Future Directions for NSF Advanced Computing Infrastructure to Support U.S. Science in 2017-2020*. An interim report is expected at the end of the summer, and the final report is expected in the summer of 2015.

Another effort, led by the OSTP, is convening federal agencies to develop a National Strategic Computing Initiative. The motivation comes from the recognition that high-performance computing is essential to security, global economic competitiveness, and scientific discovery. The initiative will consider a five- to 15-year time horizon.

Meeting with NSF Director and Deputy Director

NSF Director Dr. France Córdova and Deputy Director Dr. Cora Marrett joined the AC. They first thanked Dr. Jahanian for his dedication and contributions as CISE AD. After introductions of the AC members, Dr. Culler began the discussion by asking Dr. Córdova of her initial impressions of NSF. She responded by remarking about NSF's talented workforce, how well the directorates work together, and the need to increase science literacy. CISE's broadening participation activities were discussed, and the Broadening Participation in Computing Alliances were highlighted as an example for how to implement the recommendation from the CEOSE for center-like investments to facilitate institutional change.

NSF Program Updates Part II

BRAIN Initiative

Dr. Howard Wactlar provided an overview of the BRAIN initiative. NSF priority areas include multiscale and multimodal modeling, and comparative analyses across species and over time. NSF is uniquely positioned to lead interdisciplinary efforts to advance the non-medical aspects

of cognitive sciences and neurosciences. Dr. Wactlar also made the case that CISE research is integral to these efforts.

Envisioning the Future of the Internet
Dr. Keith Marzullo provided background information on the CISE Future Internet Architecture (FIA) program as well as an update on its current activities under the FIA-Next Phase solicitation, which leverages and enhances FIA designs into proof-of-concept experiments at-scale. The activities supported through this program complement other existing networking research efforts in CISE [e.g., GENI, US Ignite, NSFCloud, Campus Cyberinfrastructure-Infrastructure, Innovation, and Engineering (CC*IIE), and International Research Network Connections (IRNC)] to envision the future of the Internet.

Exploiting Parallelism and Scalability
Dr. Rao Kosaraju provided an update on the Exploiting Parallelism and Scalability (XPS) program and emphasized the collaborative nature of this program across all of CISE.

Report from the Support for the Statistical Sciences at NSF (StatSNSF) Subcommittee of the Mathematical and Physical Sciences Advisory Committee
Drs. Victoria Stodden and Alex Szalay, who also serve on the Support for the Statistical Sciences at NSF (StatSNSF) Subcommittee of the Directorate for Mathematical and Physical Sciences Advisory Committee, presented the recommendations from the subcommittee's draft report. The AC members engaged in much discussion. Concerns were voiced about the recommendation to form an NSF office focused on data science.

Closing Remarks and Wrap-up
Dr. Jahanian announced that Dr. Jennifer Rexford would be stepping down from the AC and that Dr. Fran Berman had agreed to serve as a co-chair for the AC. He thanked the members for their service, and remarked that serving at NSF had been an honor and encouraged the members to urge others to come and serve. Dr. Culler announced the next meeting dates of November 13-14, 2014, and adjourned the meeting at 1:30 p.m.

Appendix I: Attendance for CISE AC May 15-16, 2014

AC Members Present
Francine Berman, Rensselaer Polytechnic Institute
David Culler, University of California at Berkeley
Susan Davidson, University of Pennsylvania
Jose Fortes, University of Florida
Juan Gilbert, Clemson University
Brent Hailpern, IBM Research - Almaden
Charles Isbell, Jr., Georgia Institute of Technology
James Kurose, University of Massachusetts Amherst
James Landay, University of Washington
Craig Partridge, BBN Technologies *(Present on May 15, 2014 only)*
Ronitt Rubinfeld, Massachusetts Institute of Technology
Rob Rutenbar, University of Illinois
Robert Schnabel, Indiana University
Victoria Stodden, Columbia University
Alex Szalay, The Johns Hopkins University

AC Members Absent
Jaime Carbonell, Carnegie Mellon University
Henrik Christensen, Georgia Institute of Technology
Teresa Dahlberg, University of North Carolina - Charlotte
Peter Lee, Microsoft Research Redmond
Jennifer Rexford, Princeton University
Stefan Savage, University of California, San Diego
Jeffrey Vitter, University of Kansas